

## SECTION 15

### RIGGING

#### 15.A GENERAL

##### 15.A.01 Inspection and use.

a. Rigging equipment shall be inspected as specified by the manufacturer, by a Competent Person, before use on each shift and as necessary during its use to ensure that it is safe.

b. Defective rigging shall be removed from service.

c. The use and maintenance of rigging equipment shall be in accordance with recommendations of the rigging manufacturer and the equipment manufacturer. Rigging equipment shall not be loaded in excess of its recommended working load limit (WLL) ~~rated capacity~~.

d. Rigging equipment, when not in use, shall be removed from the immediate work area and properly stored and maintained in a safe condition.

##### 15.A.02 Hoist rope shall not be wrapped around the load.

15.A.03 Running lines located within 6 ft - 6 in (1.9 m) of the ground or working level shall be guarded or the area restricted by physical barriers to preclude injury or injury from broken lines.

15.A.04 All eye splices shall be made in an approved manner. Rope thimbles of proper size shall be fitted in the eye, except that in slings the use of thimbles shall be optional.

15.A.05 When hoisting loads, a positive latching device shall be used to secure the load and rigging (e.g., self-closing safety

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latches, hook with a spring-loaded gate, an alloy anchor type shackle with a bolt, nut and retaining pin, screw-pin shackle, etc). >

**See paragraph 15.H.07.c.**

~~15.A.06 Hooks, shackles, rings, pad eyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged shall be removed from service.~~

~~15.A.067 Custom designed and fabricated grabs, hooks, clamps, or other lifting accessories (e.g., equalizing beams, lifting or spreader beams, etc.) for such units as modular panels, prefabricated structures, and similar materials shall be designed by an RPE, marked to indicate the working load limit (WLL) rated capacity and shall be proof-tested before initial use, to 125% of their rated load working load limit (WLL).~~

~~15.A.078 Structural and mechanical lifting devices shall be designed, tested and used in accordance with ASME B30.20, Below the Hook Lifting Devices.~~

## **15.B PERSONNEL QUALIFICATIONS**

15.B.01 Any worker engaged in the duties and the performance of rigging shall be a Qualified Rigger. Employers must determine and designate in writing whether a person is qualified to perform specific rigging tasks and provided to the GDA for acceptance.

➤ **NOTE: The term “rigger” or “qualified rigger” in this manual refers to the function performed, and in no way relates to the worker’s job classification or position.**

a. A Qualified Rigger is a rigger who meets the criteria for a Qualified Person. Each Qualified Rigger may have different credentials or experience. A Qualified Rigger is a person that:

(1) Possesses a recognized degree, certificate or professional standing, OR

(2) Has extensive knowledge, training and experience AND

(3) Can successfully demonstrate the ability to solve problems related to rigging loads.

b. In addition a Qualified Rigger must:

(1) Be at least 18 years of age;

(2) Be able to communicate effectively with the crane operator, the lift supervisor, signal person and affected personnel on site;

(3) Have basic knowledge and understanding of equipment-operating characteristics, capabilities, and limitations and one whose competence in this skill has been demonstrated through training and experience satisfactory to management personnel.

15.B.02 In addition, Qualified Riggers shall be able to demonstrate knowledge and proficiency to appropriate management personnel in the following:

- a. Personnel roles and responsibilities;
- b. Site preparation (terrain, environment);
- c. Rigging equipment and materials;
- d. Safe Hoisting Equipment operating procedures;
- e. Principles of safe rigging;
- f. Environmental hazards (overhead interferences);
- g. Rigging and handling the load;
- h. Identification of hoisting-related hazards;

i. The associated hazards when employee is required to be in the fall zone to handle a load.

**15.C MULTIPLE LIFT RIGGING (MLR).** USACE allows multiple lift rigging practices **for the purpose of erecting/placing structural steel ONLY.**

15.C.01 Strict compliance with this section and 1926.753 Subpart R shall be mandated.

15.C.02 A Multiple Lift **is considered a critical lift** and requires a carefully detailed, written critical lift plan per Section 16.H. In addition, all details and requirements of this section are required to be addressed in the Critical Lift Plan to include, as a minimum: identifying all multi-lift hazards on the job site, beam list; determining load capacity; determining weight of a member; proper crane hand signals; safety rules for Multi-lift rigging; seven- foot rule; wind/environmental limits; safe route; power line issues; crane requirements; marking centerlines; use of tag line; qualifications and/or certifications of the operator(s) and rigger(s) to be performing these operations; rigging equipment: wire rope slings, hooks & shackles; clean lay-down area; cribbing; storage/staging; personal protective equipment.

15.C.03 A multiple lift may only be performed if the following criteria are met:

- a. A MLR assembly is used;
- b. A maximum of five members are hoisted per lift;
- c. Only beams and similar structural members are lifted;
- d. All employees engaged in MLR shall be trained in the following:

- (1) The nature of the hazards associated with multiple lifts;

(2) The proper procedures and equipment to perform multiple lifts required in this section and as per 1926.753(e).

e. All loads shall be rigged by a qualified rigger per 15.B;

f. No crane is permitted to be used for a multiple lift where such use is contrary to the manufacturer's specifications and limitations;

g. Components of the MLR assembly shall be specifically designed and assembled with a maximum capacity for total assembly and for each individual attachment point. This capacity, certified by the manufacturer or a qualified rigger, shall be based on the manufacturer's specifications with a 5:1 safety factor for all components.

h. The total load shall not exceed:

(1) The ~~rated capacity~~ working load limit (WLL) of the hoisting equipment specified in the hoisting equipment load charts;

(2) The rigging capacity specified in the rigging rating chart.

i. The MLR assembly shall be rigged with members:

(1) Attached at their center of gravity and maintained reasonably level;

(2) Rigged from the top down; and

(3) Rigged at least 7 feet (2.1 m) apart.

j. The members on the MLR assembly shall be set from the bottom up.

k. Controlled load lowering shall be used whenever the load is over the connectors.

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**15.D WIRE ROPE INSPECTION, MAINTENANCE AND REPLACEMENT** This has been moved here from 16.D.12

15.D.01 A competent person shall perform this inspection for each shift, visually inspecting all running ropes and counterweight ropes and load trolley ropes, if provided. Visual inspection shall concentrate on identifying apparent deficiencies in wire rope as categorized below. Opening of wire rope or booming down is not required as part of this inspection.

15.D.02 Category I. Apparent deficiencies in this category include the following:

- a. Distortion of wire rope structure such as kinking, crushing, unstranding, bird caging, main strand displacement, core failure or protrusion between the outer strands;
- b. General corrosion;
- c. Electric arc (from a source other than power lines) or heat damage;
- d. Severely corroded or broken wires at end connections; severely corroded, cracked bent, worn, or improperly applied end connections.

15.D.03 Category II. Apparent deficiencies in this category include the following:

- a. Number, distribution and type of visible broken wires are as per IPT's Crane and Rigging training Manual;
- b. A diameter reduction of more than 5% from nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.

15.D.04 Category III. Apparent deficiencies in this category include the following:

- a. Core failure or protrusion in rotation resistant ropes;
- b. Electrical contact with a power line; OR

c. A broken strand (care shall be taken when inspecting rotation resistant ropes because of their susceptibility to damage from misuse and potential for deterioration when used on equipment with limited design parameters).

15.D.05 Critical Review Items. Particular attention should be given to:

- a. Rotation resistant wire rope in use;
- b. Boom hoist ropes and sections of rope subject to rapid deterioration such as at flange points, crossover points, and repetitive pickup points on drums;
- c. Sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited;
- d. Sections of the rope at or near terminal ends where corroded or broken wires may protrude; AND
- e. Sections subject to reverse bends and sections normally hidden during routine visual inspections, such as parts passing over outer sheaves.

15.D.06 Removal from Service.

a. If a Category I deficiency is identified, an immediate determination shall be made by the competent person as to whether the deficiency constitutes a safety hazard. If so, operations involving the use of the wire rope in question shall be prohibited until:

- (1) The wire rope is replaced; OR
- (2) If the deficiency (other than power line contact) is localized and the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.

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b. If a Category II deficiency is identified, one of the following actions must occur:

(1) Employer shall consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard, operations involving use of the wire rope shall be prohibited until the wire rope is either replaced OR the damage is removed in accordance with 16.D.12.f(1)(b), OR

(2) Institute alternative measures. The wire rope may continue to be used if the employer ensures that the following measures are implemented:

(a) A qualified person assesses the deficiency in light of the load and other conditions of use and determines it is safe to continue to use the wire rope as long as the conditions established under this paragraph are met;

(b) A qualified person establishes the parameters for the use of the equipment with the deficiency, including a reduced maximum rated load;

(c) A qualified person establishes a specific number of broken wires, strands or diameter reduction that, when reached, will require the equipment to be taken out of service until the wire rope is replaced or the damage is removed in accordance with 16.D.12.f(1)(b);

(d) A qualified person sets a time limit, not to exceed 30 days from the date the deficiency is first identified, by which the wire rope must be replaced, or the damage removed in accordance with 16.D.12.f(1)(b).

c. If a Category III deficiency is identified, operations involving the use of the wire rope in question shall be prohibited until:

(1) The wire rope is replaced; OR

(2) If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two; the undamaged portion may continue to be used. Joining lengths of wore rope by splicing

is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.

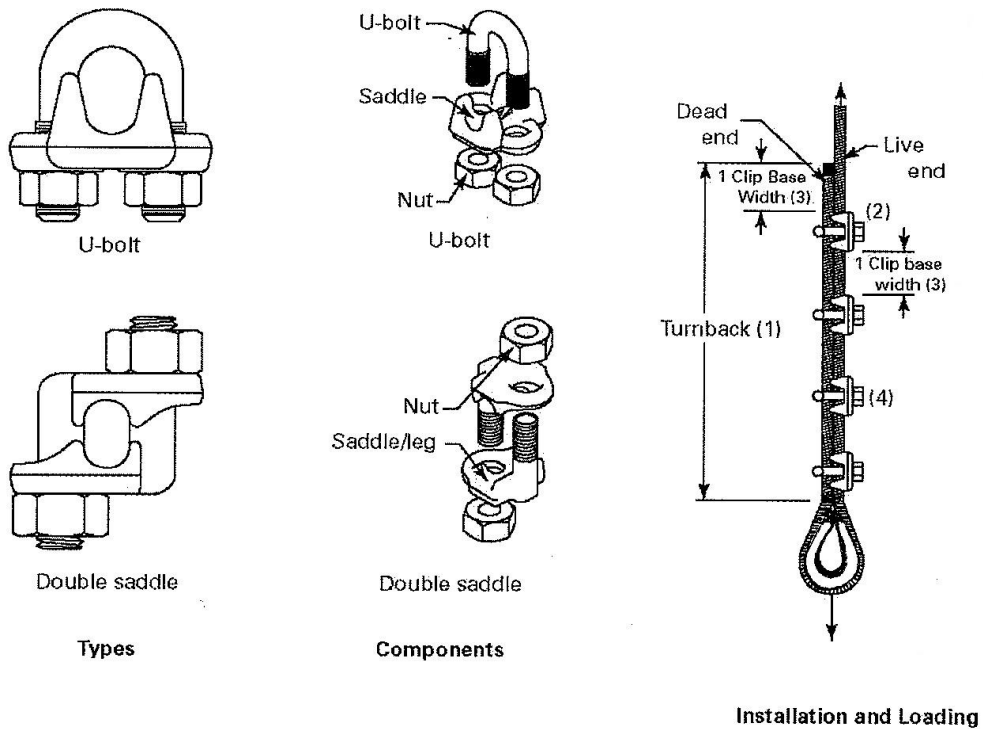
~~15.D.01 Wire rope must be inspected, maintained and replaced per 16.D.12.~~

~~15.D.02 Wire rope removed from service due to defects shall be cut up or plainly marked as unfit for further use as rigging.~~

15.D.07 Wire rope clips attached with U-bolts shall have the U-bolts on the unloaded (dead) or short end of the rope. The clip nuts shall be retightened immediately after initial load carrying use and at periodic intervals thereafter. > **See Figure 15-1.** Use only wire rope clips made from forged alloy steel of the single-saddle (U-bolt) or double-saddle type clip. Do not use malleable cast-iron clips with wire ropes utilized for hosting. Refer to the clip manufacturer or a qualified person for spacing, number of clips and torque values.

15.D.08 When a wedge socket fastening is used, the unloaded (dead) or short end of the wire rope shall be looped back and secured to itself by a clip or have a separate piece of equal size wire rope attached with a clip or be properly secured to an extended wedge. The clip shall not be attached to the load (live) end. > **See Figure 15-2.**

**FIGURE 15-1**  
**Wire Rope Clip Spacing**

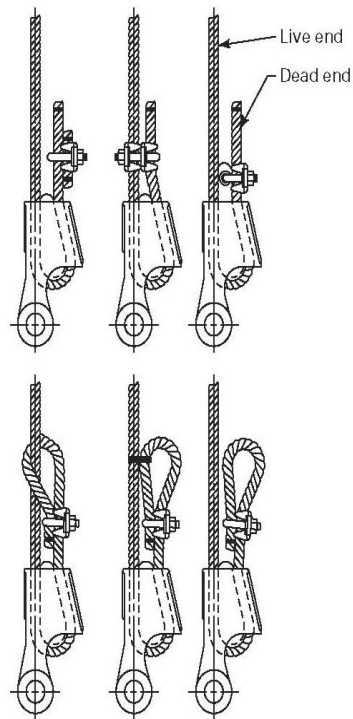
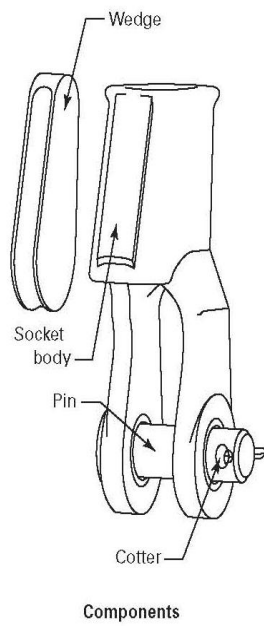


GENERAL NOTE: Correct number of clips for wire rope size shall be used.  
NOTES:

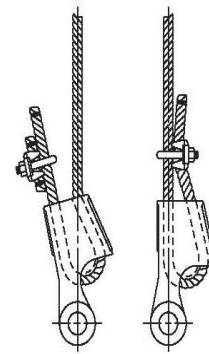
- (1) correct turnback length should be used
- (2) correct orientation of saddle on live end shall be observed
- (3) correct spacing of clips should be used
- (4) correct torque on nuts shall be applied

**NOTE (not to be printed): Deleted far right graphic, added thimble to eye above.**

**FIGURE 15-2**  
**Wire Rope Clip Orientation**



Right Installation



Wrong Installation

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~~15.D.05 Protruding ends of strands in splices on slings and bridles shall be covered or blunted.~~

~~15.D.06 Fabricated slings with eyes or endless loop slings using wire rope clips or clamps for hoisting material or lifting are prohibited except where the application precludes the use of prefabricated slings. All slings fabricated using wire rope clips shall be designed by a RPE for the specific application. Move to 15.G~~

~~15.D.09 Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads shall consist of one continuous piece without knot or splice.~~

~~a. An eye splice made in any wire rope shall have not less than five full tucks (this requirement shall not preclude the use of another form of splice or connection that can be shown to be as efficient and that is not otherwise prohibited).~~

~~b. Wire rope shall not be secured by knots except on haul back lines on scrapers.~~

~~15.D.08 Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire rope clips or knots.~~

~~15.D.09 Wire rope clips shall not be used to splice rope.~~

~~15.E.03 When used with alloy steel chains, hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments shall have a rated capacity at least equal to that of the chain.~~

~~15.E.04 Job or shop hooks and links, makeshift fasteners formed from bolts and rods, and other similar attachments shall not be used. Moved to rigging hardware~~

## 15.EG SLINGS

15.E.01 General. This section applies to slings used in conjunction with material handling equipment for hoisting. All slings shall be in accordance with ASME B30.9.

### a. Inspections.

(1) Each day prior to being used, the sling and all fastenings and attachments shall be visually inspected for damage or defects by a competent person.

(2) Annual inspections shall be performed by a Competent Person and must be documented.

(3) Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

### b. Rigging practices.

(1) All slings shall be hitched in a manner providing control of the load;

(2) Sharp edges in contact with slings shall be padded with material of sufficient strength to protect the sling;

(3) Slings shall be shortened or adjusted only by methods approved by the sling manufacturer or a qualified person;

(4) The use of slings will be such that the entire load is positively secured;

(5) In a basket hitch, the load shall be balanced to prevent slippage;

(6) When using a basket hitch, legs of the sling shall contain or support the load from the sides, above the center of gravity, so that the load remains under control;

(7) In a choker hitch, the choke point shall only be on the sling body, never on a splice or fitting;

(8) In a choker hitch, an angle of choke less than 120 degrees is shall not be used without reducing the rated load;

(9) Slings shall not be constricted, bunched, or pinched by the load, hook or any fitting;

(10) The load applied to the hook shall be centered in the base (bowl) of the hook to prevent point loading on the hook, unless the hook is designed for point loading;

(11) An object in the eye of a sling is not wider than one-third the length of the eye;

(12) The load shall not be landed on the sling;

(13) A sling shall not be pulled from under the load when resting on the sling;

(14) Slings shall not be dragged over abrasive surfaces;

(15) Shock loading is not allowed;

(16) Slings shall not be twisted or kinked.

~~15.G.02 Protection shall be provided between the sling and sharp unyielding surfaces of the load to be lifted.~~

c. All slings manufactured under ANSI/ASME guidelines, must have an affixed durable permanent identification tag that includes the following as a minimum:

(1) Name or trademark of the manufacturer;

(2) Diameter or size of the sling;

(3) Type of material used;

(4) Working load limit (WLL) for a given type of hitch;

(5) Lift angle upon which the load rating is based.

d. Manila rope shall not be used for slings.

e. Fabricated eye slings or endless loop slings using alloy steel wire rope clips or clamps for hoisting material or lifting are prohibited except where the application precludes the use of prefabricated slings. All slings fabricated using alloy steel wire rope clips or clamps shall be designed by a RPE for the specific application.

#### 15.E.02 Alloy Steel Chain Slings.

a. Only alloy chain Grade 80 or higher shall be used in rigging.

b. Chain shall be inspected before initial use and weekly thereafter while in use. Inspect chains on an individual link basis. Chains shall be cleaned before they are inspected, as dirt and grease can hide nicks and cracks.

c. Chains shall be removed from service if the following conditions exist:

(1) missing or illegible sling identification;

(2) cracks or breaks;

(3) excessive wear, nicks, or gouges. Minimum thickness on chain links shall not be below the values listed in Table 15-1;

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- (4) stretched chain links or components;
- (5) bent, twisted, or deformed chain links or components;
- (6) evidence of heat damage or weld splatter;
- (7) excessive pitting or corrosion;
- (8) lack of ability of chain or components to hinge (articulate) freely;
- (9) other conditions including visible damage that cause doubt as to the continued use of the chain

**TABLE 15-1**  
**Minimum Allowable Thickness at Any Point on a Link**

<b><u>Nominal Chain or Coupling Link Size</u></b>	<b><u>Minimum Allowable Thickness</u></b>
<u>7/32 in (5.5 mm)</u>	<u>0.19 in (4.80 mm)</u>
<u>9/32 in (7 mm)</u>	<u>0.24 in (6.07 mm )</u>
<u>5/16 in (8 mm)</u>	<u>0.27 in (6.93 mm)</u>
<u>3/8 in (10 mm)</u>	<u>0.34 in (8.69 mm)</u>
<u>1/2 in (13 mm)</u>	<u>0.44 in (11.26 mm)</u>
<u>5/8 in (16 mm)</u>	<u>0.55 in (13.87 mm)</u>
<u>3/4 in (20 mm)</u>	<u>0.69 in (17.45 mm)</u>

<u>7/8 in (22 mm)</u>	<u>0.75 in (19.05 mm)</u>
<u>1 in (26 mm)</u>	<u>0.89 in (22.53 mm)</u>
<u>1-1/4 in (32 mm)</u>	<u>1.09 in (27.71 mm)</u>

d. When used with multiple leg slings alloy steel chains, hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments shall have a working load limit (WLL) rated capacity at least equal to that of the assembly chain.

15.E.03 Wire Rope Slings. Wire rope slings shall be inspected by a competent person for the following:

- a. Broken wires;
- b. Severe localized abrasion or scraping;
- c. Kinking, crushing, bird caging or any other damage to the rope structure;
- d. Evidence of heat damage;
- e. Crushed, deformed, or worn end attachments;
- f. Severe corrosion of the rope, and attachments or fittings;
- g. Missing or illegible sling identification;
- h. Other conditions that cause doubt as to safe use of sling.

15.E.04 Metal Mesh Slings. Metal mesh slings shall be inspected by a competent person for the following:

- a. Broken weld or brazed joint along the sling edge;
- b. Broken wire in any part of the mesh;

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c. Reduction in wire diameter of 25% due to abrasion or 15% due to corrosion;

d. Lack of flexibility due to distortion of the mesh;

e. Distortion of the choker fitting so that the depth of the slot is increased by more than 10%;

f. Distortion of either end fitting so the width of the eye opening is decreased by more than 10%;

g. A 15% reduction of the original cross-sectional area of metal at any point around the hook opening of end fitting;

h. Excessive pitting or corrosion of fittings; broken or cracked fittings; distortion of either end fitting out of its plane;

i. A sling in which the spirals are locked or without free articulation;

j. Other visible damage that causes doubt as to the strength of the sling.

#### 15.E.05 Synthetic Fiber Rope Slings

a. Synthetic rope slings shall be inspected by a competent person for the following:

(1) Broken or cut fibers, either internally or externally;

(2) Cuts, gouges, abrasions; seriously or abnormally worn fibers;

(3) Powdered fiber or particles of broken fiber inside the rope between the strands;

(4) Variations in size or roundness of strands;

- (5) Discoloration or rotting; weakened or brittle fibers;
- (6) Excessive pitting or corrosion, or cracked, distorted, or broken fittings;
- (7) Kinks;
- (8) Melting or charring of the rope;
- (9) Other visible damage that causes doubt as to the strength of the rope.

b. Synthetic rope slings shall not be used while frozen. When using synthetic rope slings in chemically active or excessively hot environments, consult with the sling manufacturer or Qualified Person.

c. Synthetic rope slings shall be protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces.

d. Do not allow synthetic rope slings to be used in contact with objects or at temperature in excess of 194 degree F (90 de C) or below -40 de F (40 degrees C). NOTE: Some synthetic yarns do not retain their breaking strength during long term exposure above 140 deg F (60 deg C).

~~15.F.04 All splices in synthetic rope slings provided by the employer shall be made in accordance with fiber rope manufacturer's recommendations.~~

e. Eye Splices. All splices shall be made per the rope manufacturer or a Qualified Person and in accordance with ASME B30.9.

~~a. In manila rope, eye splices shall contain at least three full tucks and short splices shall contain at least six full tucks (three on each side of the centerline of the splice).~~

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~~b. In layed synthetic fiber rope, eye splices shall contain at least four full tucks and short splices shall contain at least eight full tucks (four on each side of the centerline of the splice).~~

~~15.F.06 Strand end tails shall not be trimmed short (flush with the surface of the rope) immediately adjacent to the full tucks; this applies to both eye and short splices and all types of fiber rope.~~

~~a. For fiber ropes less than 1 in (2.5 cm) diameter, the tails shall project at least six rope diameters beyond the last full tuck.~~

~~b. For fiber ropes 1 in (2.5 cm) diameter and larger, the tails shall project at least 6 in (15.2 cm) beyond the last full tuck.~~

~~15.F.07 In applications where the projecting tails may be objectionable, the tails shall be tapered and spliced into the body of the rope using at least two additional tucks (which will require a tail length of approximately six rope diameters beyond the last full tuck).~~

~~15.F.08 For all eye splices, the eye shall be sufficiently large to provide an included angle of not greater than 60° at the splice when the eye is placed over the load or support.~~

f. Knots shall not be used in lieu of eye splices.

#### 15.E.06 Synthetic Web Slings

a. Synthetic Web Slings shall be inspected for the following:

(1) Acid or caustic burns;

(2) Melting or charring of any part of the sling;

(3) Snags, holes, tears, or cuts;

(4) Broken or worn stitches;

(5) Excessive abrasive wear;

(6) Knots in any part of the sling;

(7) Wear or elongation exceeding the amount recommended by the manufacturer;

(8) Excessive pitting or corrosion, or cracked, distorted, or broken fittings;

(9) Other visible damage that causes doubt as to the strength of the sling.

b. Do not allow Synthetic web slings to be used in contact with objects or at temperature in excess of 194 degree F (90 de C) or below -40 de F (40 degrees C). NOTE: Some synthetic yarns do not retain their breaking strength during long term exposure above 140 deg F (60 deg C).

#### 15.E.07 Synthetic Round Slings

a. New slings shall be marked by the manufacturer to show:

(1) The rated load for the types of hitches, and the angle upon which they are based;

(2) The core material;

(3) The cover material if different from the core material.

b. Synthetic Round Slings shall be inspected for the following and where any such damage or deterioration is present, remove the sling or attachment from service immediately:

(1) Missing or illegible sling identification;

(2) Acid or Caustic burns;

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- (3) Evidence of heat damage;
  - (4) Holes, tears, cuts, abrasive wear, or snags, that expose the core yarn;
  - (5) Broken or damaged core yarns;
  - (6) Welding spatter that exposes the core yarns;
  - (7) Knots in the round sling body, except for core yarn knots inside the cover;
  - (8) Discoloration and brittle or stiff areas on any part of the sling;
  - (9) Pitted, corroded, cracked, bent, twisted, gouged, or broken fittings;
  - (10) Other conditions that cause doubt as to the continued use of the sling.
- c. Do not allow Synthetic Round Slings to be used in contact with objects or at temperature in excess of 194 degree F (90 de C) or below -40 de F (40 degrees C). NOTE: Some synthetic yarns do not retain their breaking strength during long term exposure above 140 deg F (60 deg C).

~~15.G.04 Lengths.~~

- ~~a. Wire rope slings shall have a minimum length of clear wire rope equal to ten times the rope diameter between each end fitting or eye splice.~~
- ~~b. Braided slings shall have a minimum clear length of braided body equal to forty times the diameter of component ropes between each end fitting or eye splice.~~

~~15.G.06 Wire rope slings shall have affixed a durable permanent identification tag stating the diameter, rated load, lifting capacity in vertical, choker, basket configuration, and date placed in service.~~

~~15.G.07 The employer shall have each synthetic rope sling, metal mesh sling, synthetic web sling, or round sling marked or coded to show name or trademark of the manufacturer, rated loads for the type(s) of hitch(es) used and the angle upon which it is based, type of fiber material, number of legs, if more than one, capacities for the type of hitch, and type of material.~~

## **15.F RIGGING HARDWARE**

15.F.01 All rigging hardware shall be inspected for defects prior to use.

15.F.02 Rigging hardware (excluding sheaves, drums and pulleys) shall not be painted once purchased.

15.F.03 Drums, sheaves, and pulleys shall be smooth and free of surface defects that may damage rigging. In addition, drums, sheaves, or pulleys having eccentric bores, cracked hubs, spokes, or flanges shall be removed from service.

~~a. Hooks that show wear exceeding 10% or an increase in the throat opening of 5% (maximum of ¼ in (6mm)), or as recommended by the manufacturer, or any visibly apparent bend or twist from the plane of the hook. B30.10-1.10.5—Moved to 15.H.07~~

~~b. Deformed master links and coupling links.~~

~~c. Assemblies with cracked hooks or other end fittings.~~

~~d. Excessive pitting or corrosion, or distorted or broken fittings.~~

~~e. Other visible damage that causes doubt as to the strength of the attachment.~~

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~~15.H.02 The ratio between the diameter of the rigging and the drum, block, sheave, or pulley tread diameter shall be such that the rigging will adjust itself to the bend without excessive wear, deformation, or damage.~~

~~15.H.03 In no case will the safe diameters of drums, blocks, sheaves, or pulleys be reduced in replacement of such items unless compensating changes are made in terms of the rigging used and the safe loading limits.~~

~~15.H.04 Drums, sheaves, or pulleys having eccentric bores, cracked hubs, spokes, or flanges shall be removed from service.~~  
Moved to 15.H.02

15.F.04 Connections, fittings, fastenings, and attachments used with rigging shall be of good quality, of proper size and strength, and shall be installed in accordance with recommendations of the manufacturer.

15.F.05 Job hooks, shop hooks and links, makeshift fasteners formed from bolts and rods, and other similar attachments shall not be used.

15.F.06 Shackles. > **See ASME B30.26.**

a. Only marked shackles (marked by manufacturer with name or trademark of manufacturer, ~~rated load~~ working load limit (WLL) and size) shall be used. Shackles shall be maintained by the user so as to be legible throughout the life of the shackle.

b. Each new shackle pin shall be marked by manufacturer to show name or trademark of manufacturer and grade, material type or load rating.

c. Shackles shall be inspected visually by the user (or other designated person) prior to each use and periodically.

d. Repairs and/or modifications may only be as specified by the manufacturer or Qualified Person. Replacement parts, like pins, shall meet or exceed the original manufacturer's specifications.

e. Shackles shall not be eccentrically loaded (apply load to center of bow), shock loaded, nor shall they be loaded in excess of the working load limit (WLL) rated capacity.

f. Multiple sling legs shall not be applied to the shackle pin.

15.F.07 Hooks. > **See ASME B30.10. See Figure 15-3.**

a. Hooks that show wear exceeding 10% or an increase in the throat opening of 5% (maximum of ¼ in (6mm)), or as recommended by the manufacturer, or any visibly apparent bend or twist from the plane of the hook shall be removed from service.

b. The manufacturer's recommendations shall be followed in determining the ~~rated load~~ working load limit (WLL) of the various sizes and types of specific and identifiable hooks. Any hook for which the manufacturer's recommendations are not available shall be tested to twice the intended safe working load before it is put into use. The employer shall maintain a record of the dates and results of such tests.

c. Open hooks are prohibited in rigging used to hoist loads except for miscellaneous-type hooks (i.e., grab hooks, foundry hooks, sorting hooks and choker hooks) may be used as long as they are used, inspected and maintained in accordance with manufacturer's recommended use. The use of these specialty-type hooks shall be identified in the applicable AHA and submitted to the GDA for acceptance.

d. The need for a latch or mousing on any hook is a function of the application of the hook and shall be determined by a Qualified Person (e.g., duplex and quad hooks); See ASME B30.10, 10-1.11.2).

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e. Manufacturer's identification and rated load identification shall be forged, cast, or die stamped on a low stress and nonwearing area of the hook.

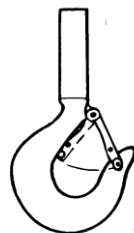
DRAFT #1

**FIGURE 15-3**

**HOOKS**



**SELF-CLOSING TIPLOCK LATCH (EYE HOOK)**



**SELF-CLOSING TIPLOCK LATCH (SHANK HOOK)**



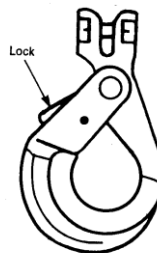
**SELF-CLOSING BAIL (EYE HOOK)**



**SELF-CLOSING FLAPPER LATCH  
LAMINATED PLATE HOOK**



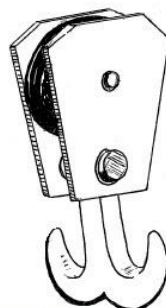
**SELF-CLOSING FLAPPER LATCH  
(SHANK HOOK)**



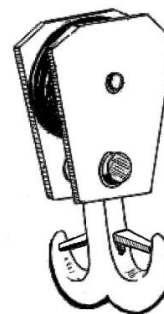
**SELF-LOCKING CLEVIS HOOK  
(CLOSED)**



**EYE GRAB HOOK**



**DOUBLE/ SISTER HOOK  
OPEN**



**DOUBLE/ SISTER HOOK  
CLOSED**

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15.F.08 Drums.

a. Drums shall have sufficient rope capacity with recommended rope size and reeving to perform all hoisting and lowering functions.

b. At least three full wraps (not layers) of rope shall remain on the drum at all times. Overhead and gantry cranes shall have at least two full wraps of wire rope on the drums at all times.

c. The drum end of the rope shall be anchored by a clamp securely attached to the drum with an arrangement approved by the manufacturer.

~~d. The flanges shall project beyond the top layer of rope per the manufacturer's recommendations (but never less than ½ in (13 mm)). Grooved drums shall have the correct groove pitch for the diameter of the rope. The depth of the groove shall be correct for the diameter of the rope.~~

~~(1) The flanges on grooved drums shall project beyond the last layer of rope a distance of either 2 in (5 cm) or twice the diameter of the rope, whichever is greater.~~

~~(2) The flanges on ungrooved drums shall project beyond the last layer of rope a distance of either 1/2 in (6.3 cm) or twice the diameter of the rope, whichever is greater.~~

15.F.09 Sheaves.

a. Sheaves shall be compatible with the size of rope used, as specified by the manufacturer.

b. Sheaves shall be inspected to ensure they are of correct size, properly aligned, lubricated, and in good condition.

c. When rope is subject to riding or jumping off a sheave, the sheave shall be equipped with cable-keepers.

15.F.10 Eyebolts, Eye Nuts, Swivel Hoist Rings and Turnbuckles.

- a. Use of this equipment shall be in accordance with ASME B30.26.
- b. ~~Rated load~~ Working load limit (WLL)s shall be in accordance with the manufacturer's recommendation.
- c. Each turnbuckle, eye nut and eyebolt shall be marked with name or trademark of manufacturer, size or ~~rated load~~ working load limit (WLL) and grade (for alloy eyebolts). In addition, each swivel hoist ring must also be marked to show torque value. Markings shall remain legible.
- d. This equipment shall be inspected visually before each use by the user (or other designated person) and at least annually to determine condition is safe for use.
- e. Turnbuckles shall not be side loaded and shall be rigged and secured to prevent unscrewing during the lift.
- f. Shoulderless eye bolts shall not be loaded at an angle.

**Deleted Rated Load in Appendix Q**

**Add:**

**Working load limit (WLL) (WLL):** the maximum allowable working load established by the rigging hardware manufacturer. The terms "rated capacity" and "rated load" are commonly used to describe the WLL.